

# **ABSTRACT**

An extendable four-port circulator includes a middle birefringent crystal, a first birefringent crystal, a first non-reciprocal device, a second birefringent crystal, and a second non-reciprocal device. The first non-reciprocal device is coupled to the first birefringent crystal. The second non-reciprocal device is coupled to the second birefringent crystal. The middle birefringent crystal includes a first surface, a second surface, a third surface, and a fourth surface. The first surface is coupled to the first non-reciprocal device. The second surface is coupled to the second non-reciprocal device. The third surface defines first and second extension interfaces. The fourth surface defines third and fourth extension interfaces. A multi-port circulator includes at least one extendable four-port circulator.

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